



Advancing Water Supply Forecasts in the Colorado River Basin for Improved Decision Making

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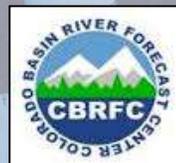


Photo by D.Perrot

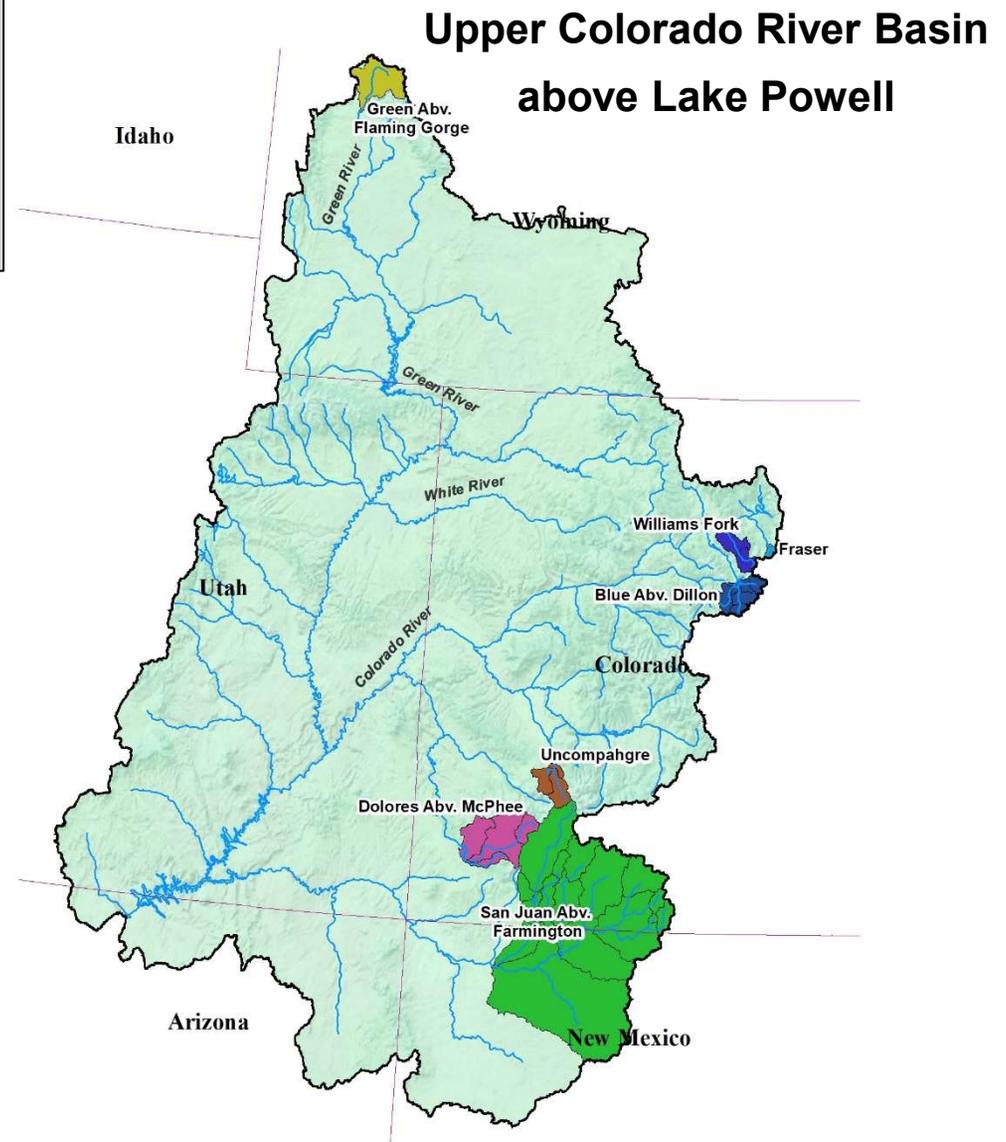
Problem Statement / Goals

How to ensure a sustainable water supply as future water demands increase and threats such as pollution, land use change, and climate change alter the hydrologic landscape?

Provide improved water supply forecasts

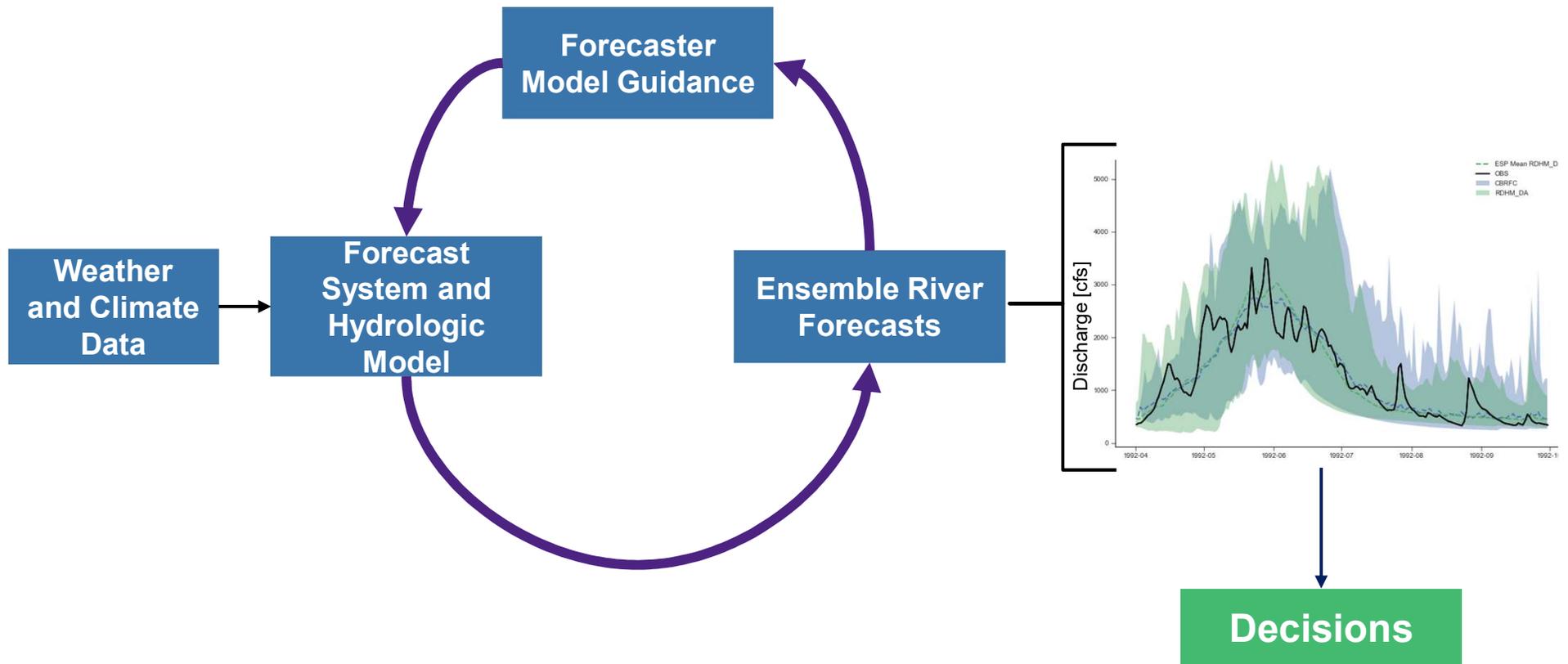
Show value to decision makers

Research-to-operations



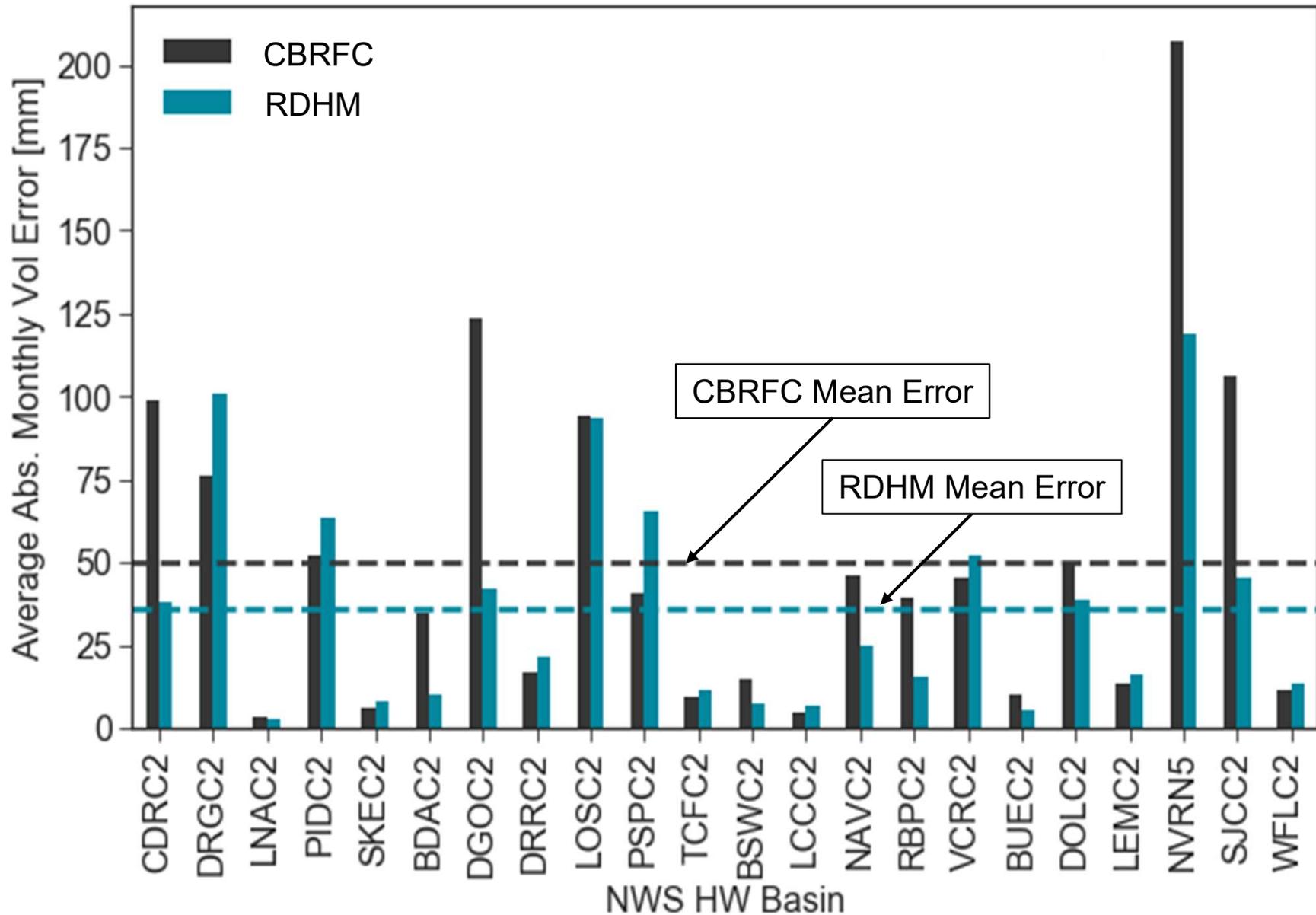
How do we improve water supply forecasts in the Upper Colorado River Basin?

River Forecast Center Water Supply Forecast Process



How to we add incremental improvements/addition skill?

Research Distributed Hydrologic Model

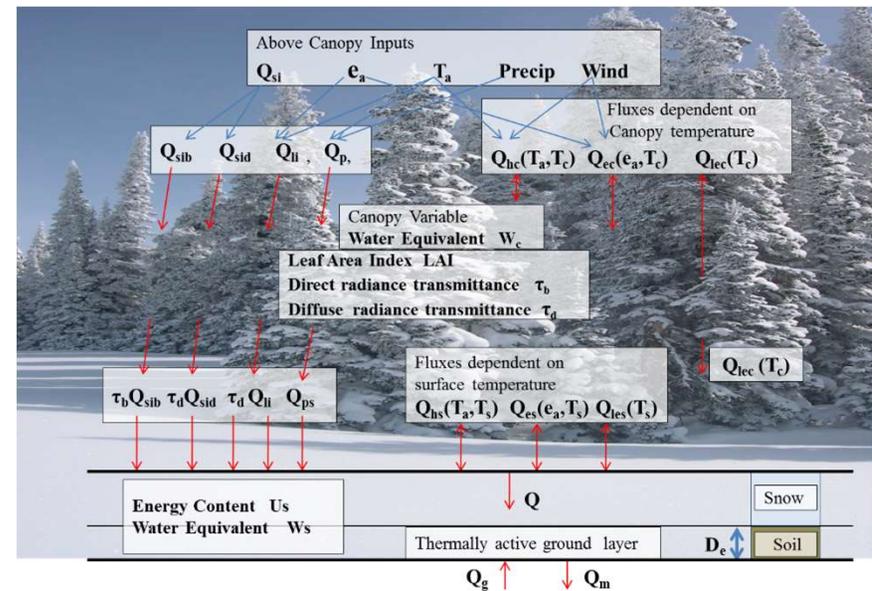


Utah Energy Balance Snowmelt Model

- Physically-based single layer model
- Gridded

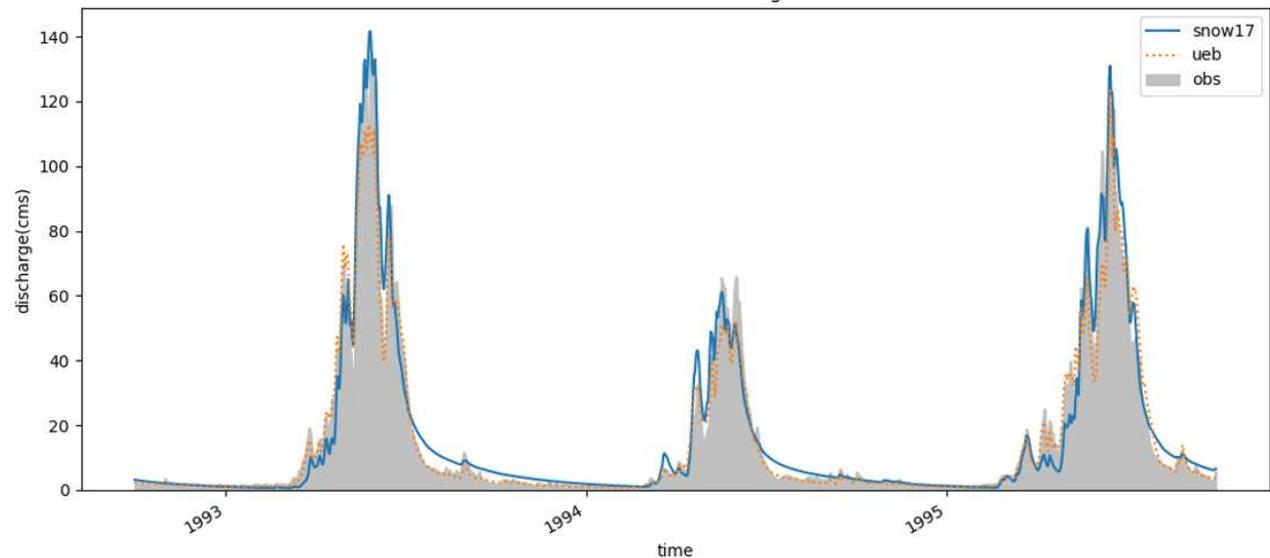
Why use an energy balance model?

- Physics could improve snowmelt modeling
- Better suited for snow data assimilation of observed data (i.e. station based, satellite, etc.)



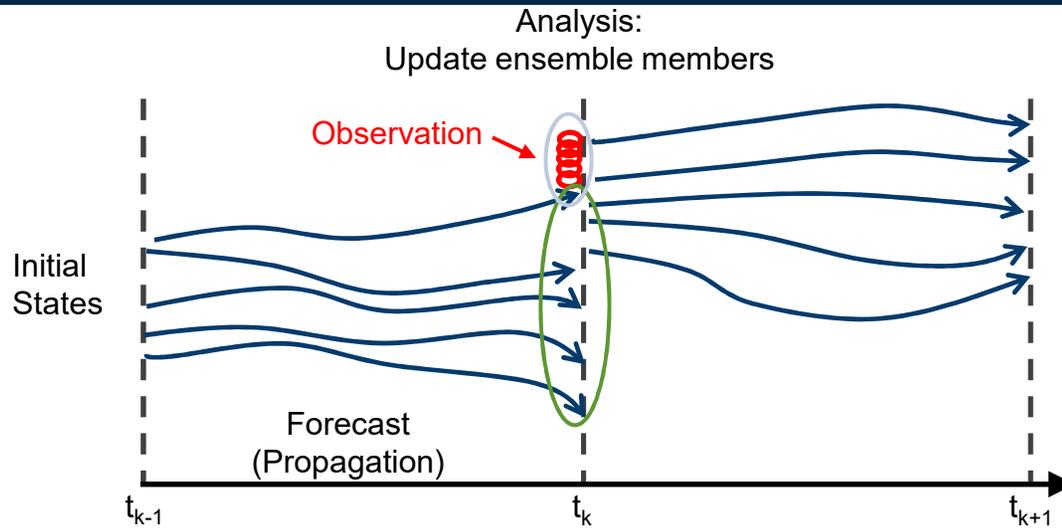
Mahat, V. and D. G. Tarboton, (2012), "Canopy radiation transmission for an energy balance snowmelt model," *Water Resour. Res.*, 48: W01534,

Dolores	NSE	RMSE (cms)	Bias (cms)
SNOW-17	0.91	5.5	0.16
UEB	0.95	3.9	-0.01

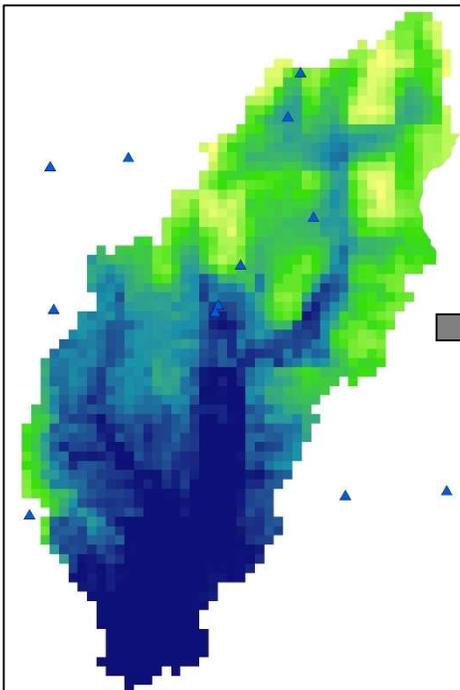


Snow Data Assimilation

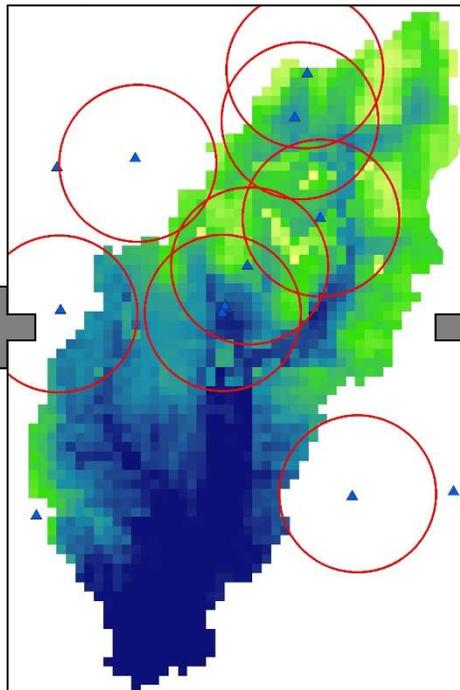
Local Ensemble Transform Kalman Filter (LETKF)



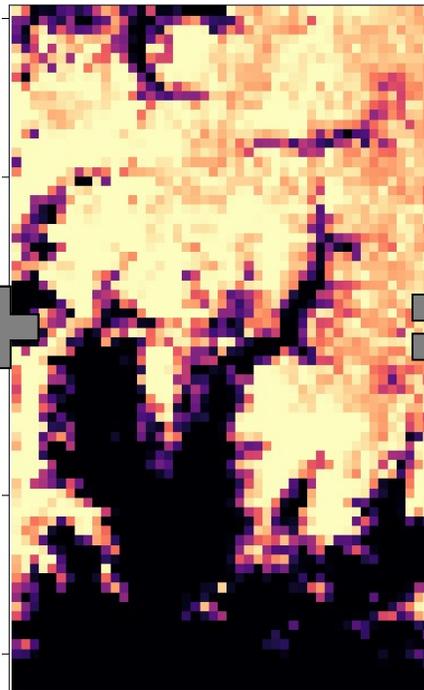
Initial Model State



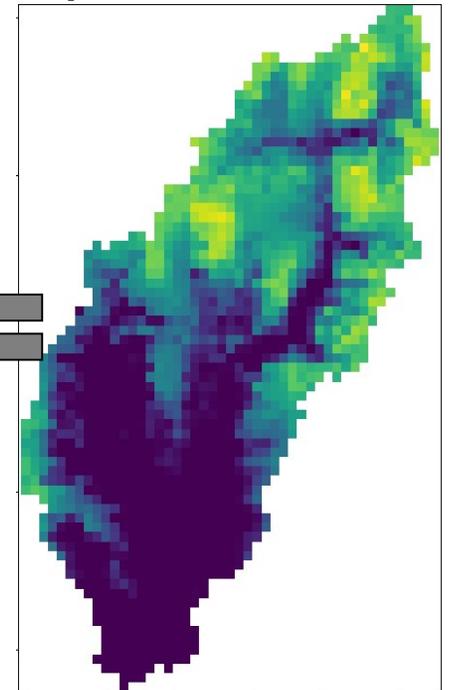
Update w/ SNOTEL



Update w/ MODSCAG

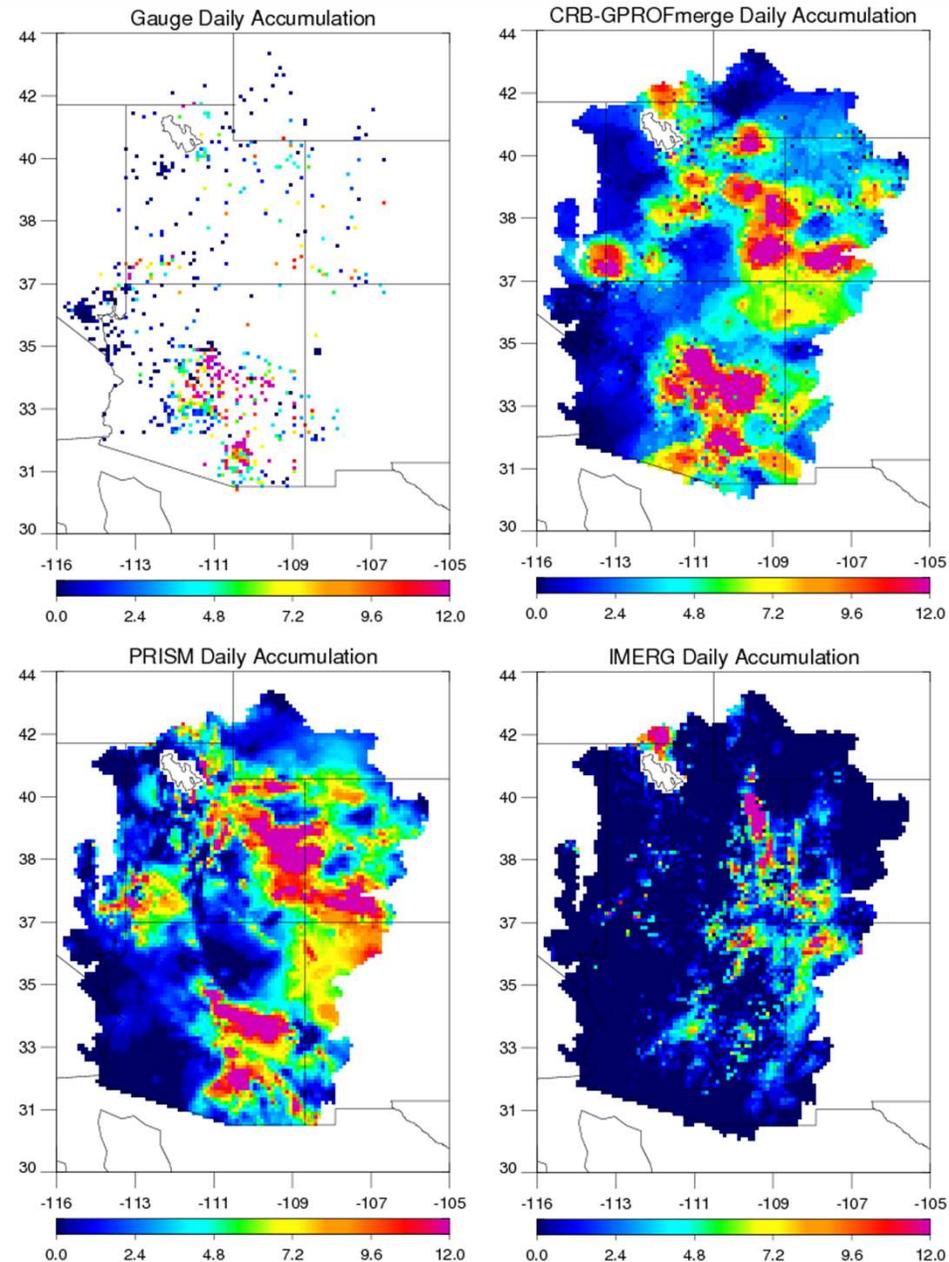


Updated SWE State

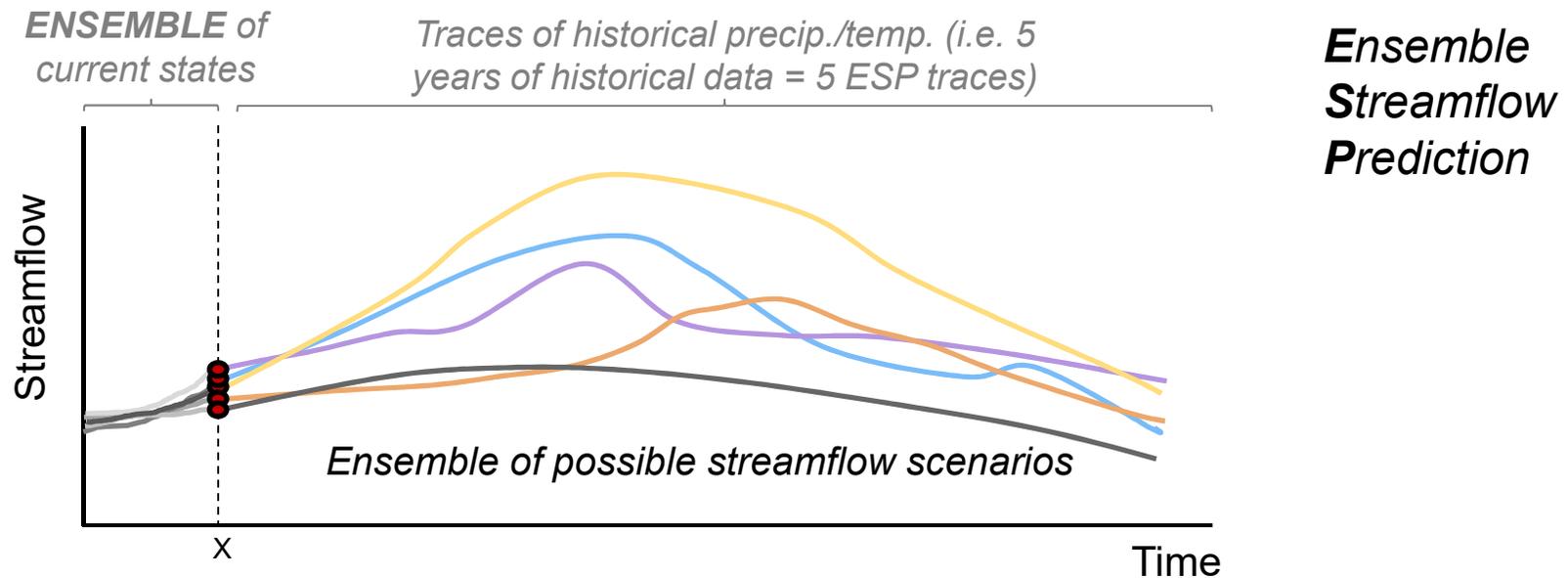


Regionally Calibrated Satellite Precipitation Data

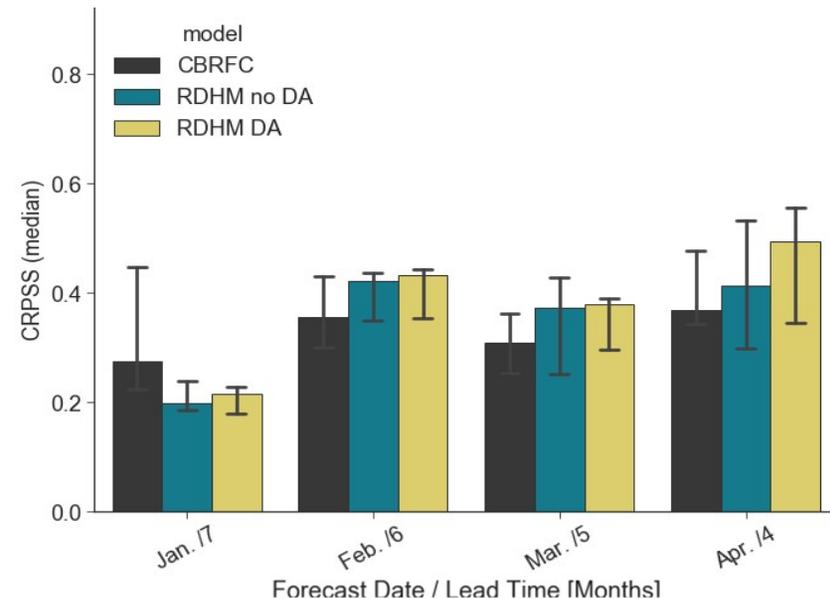
- Data from Global Precipitation Measurement (GPM) mission
- Regionally bias-correct all passive microwave sensors over Colorado River Basin (CRB) area
- Final product is merged with gage data
- Additional gage data and a CRB specific regional retrieval give CRB-GPROF an advantage over IMERG, compared to PRISM.



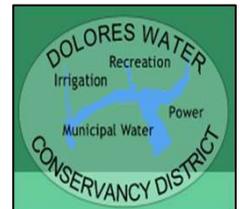
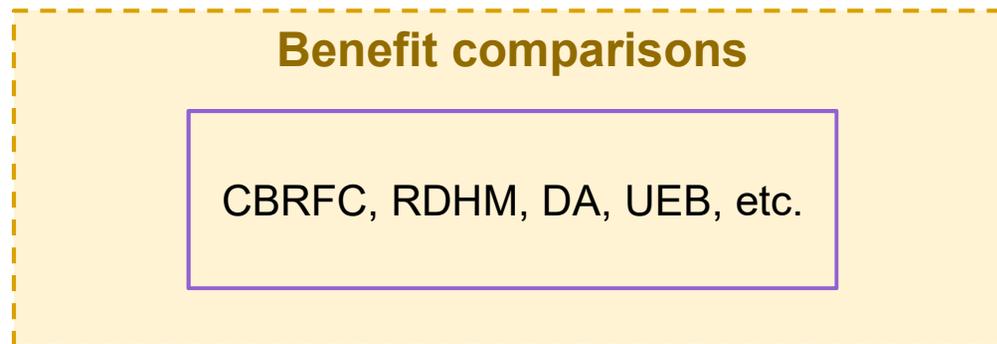
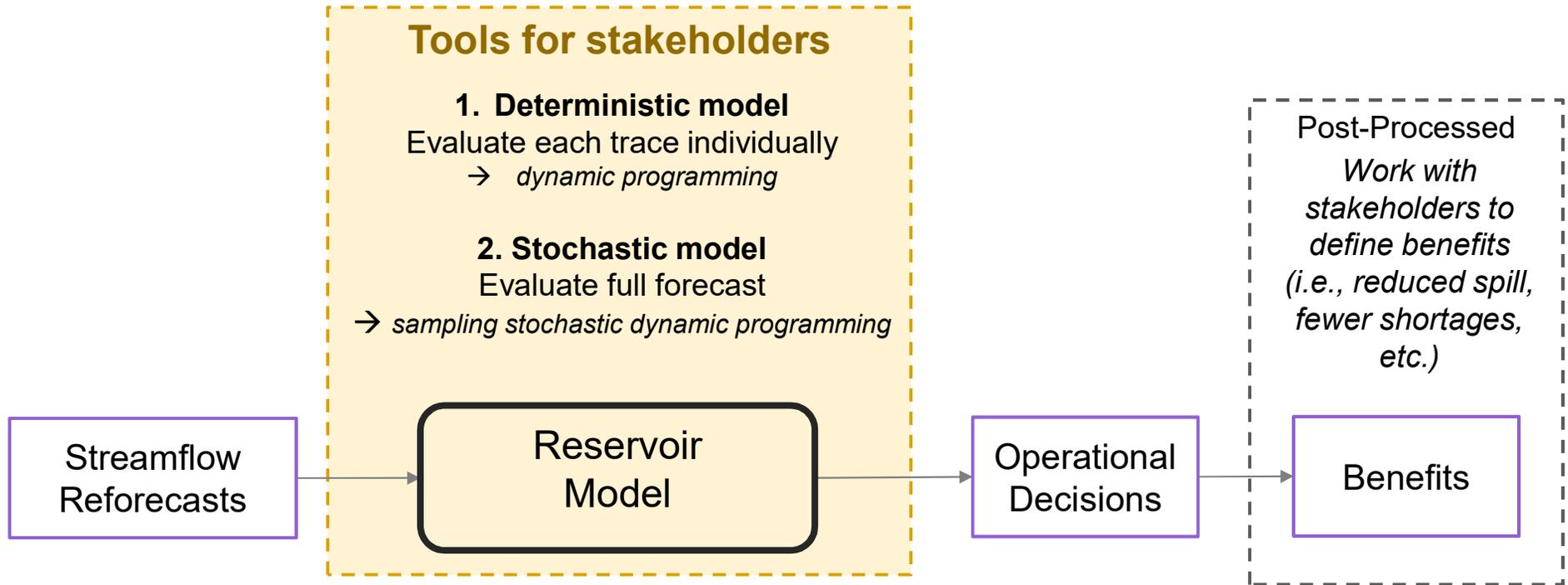
Forecast Verification Results: Incremental Improvements



- Produce probabilistic outlook of streamflow volumes
- ESP reforecasts are made on the 1st of the month from Jan-Apr, WY 1990-2010
- Verification measures are used to evaluate the accuracy and skill of the forecast



Impacts: Decision Support System



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Photo by D.Perrot

